

FASTSWITCH EASY-TO-DRIVE (ETD) NPN TRANSISTORS

PRELIMINARY DATA

- HIGH SWITCHING SPEED NPN POWER TRANSISTORS
- EASY TO DRIVE
- HIGH VOLTAGE FOR OFF-LINE APPLICATIONS
- 100KHz SWITCHING SPEED
- LOW COST DRIVE CIRCUITS
- LOW DYNAMIC SATURATION

industrial and professional power driving applications such as motor drives and off-line switching power supplies. ETD transistors will operate using easy drive circuits at up to 100KHz ; this helps to simplify designs and improve reliability. The superior switching performance and low crossover losses reduce dissipation and consequently lowers the equipment operating temperature. These ETD transistors are suitable for application in high reliability, low power, motor drives and in flyback and forward converters, 100W to 250W.

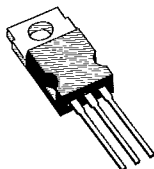
APPLICATIONS

- SMPS
- MOTOR DRIVES

These EASY-TO-DRIVE FASTSWITCH transistors are available in the TO-220 package.

DESCRIPTION

These Easy-to-Drive FASTSWITCH NPN power transistors are specially designed for high reliability



TO-220

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUF405	BUF405A	
V_{CEV}	Collector-emitter Voltage ($V_{BE} = -1.5V$)	850	1000	V
V_{CEO}	Collector-emitter Voltage ($I_B = 0$)	450		V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	7		V
I_C	Collector Current	7.5		A
I_{CM}	Collector Peak Current	15		A
I_B	Base Current	3		A
I_{BM}	Base Peak Current	4.5		A
P_{tot}	Total Dissipation at $T_c < 25^\circ C$	80		W
T_{stg}	Storage Temperature	- 65 to 150		$^\circ C$
T_j	Max. Operating Junction Temperature	150		$^\circ C$

Thermal DATA

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$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.56	°C/W
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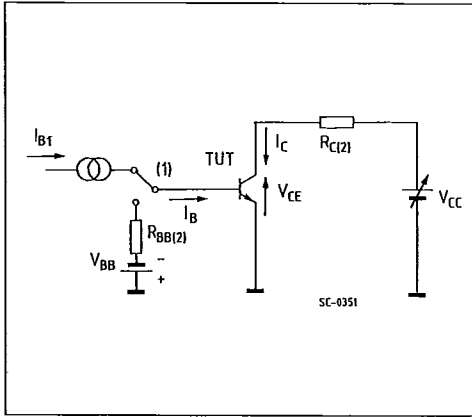
ELECTRICAL CHARACTERISTICS ($T_j = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CER}	Collector Cutoff Current ($R_{BE} = 5\Omega$)	$V_{CE} = V_{CEV}$			0.1	mA
		$V_{CE} = V_{CEV} \quad T_c = 100^\circ\text{C}$			0.5	mA
I_{CEV}	Collector Cutoff Current	$V_{CE} = V_{CEV} \quad V_{BE} = -1.5V$			0.1	mA
		$V_{CE} = V_{CEV} \quad V_{BE} = -1.5V \quad T_c = 100^\circ\text{C}$			0.5	mA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	$V_{EB} = 5V$			1	mA
$V_{CEO(sus)}^*$	Collector Emitter Sustaining Voltage	$I_C = 0.2A$ $L = 25mH$	450			V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	$I_E = 50mA$	7			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 2.5A \quad I_B = 0.25A$		0.8		V
		$I_C = 2.5A \quad I_B = 0.25A \quad T_c = 100^\circ\text{C}$			2.8	V
		$I_C = 5A \quad I_B = 1A$		0.5		V
		$I_C = 5A \quad I_B = 1A \quad T_c = 100^\circ\text{C}$			2	V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = 2.5A \quad I_B = 0.25A$		0.9		V
		$I_C = 2.5A \quad I_B = 0.25A \quad T_c = 100^\circ\text{C}$			1.5	V
		$I_C = 5A \quad I_B = 1A$		1.1		V
		$I_C = 5A \quad I_B = 1A \quad T_c = 100^\circ\text{C}$			1.5	V
di_c/dt	Rate of Rise of on-state Collector Current	$V_{CC} = 300V \quad R_C = 0 \quad t_p = 3\mu s$ $I_{B1} = 0.375A \quad T_j = 25^\circ\text{C}$ $I_{B1} = 0.375A \quad T_j = 100^\circ\text{C}$ $I_{B1} = 1.5A \quad T_j = 100^\circ\text{C}$	30 60	40		A/ μs A/ μs A/ μs
$V_{CE(3\mu s)}$	Collector-emitter Dynamic Voltage	$V_{CC} = 300V \quad R_C = 120\Omega$ $I_{B1} = 0.375A \quad T_j = 25^\circ\text{C}$ $T_j = 100^\circ\text{C}$		2.1	8	V V
$V_{CE(5\mu s)}$	Collector-emitter Dynamic Voltage	$V_{CC} = 300V \quad R_C = 120\Omega$ $I_{B1} = 0.375A \quad T_j = 25^\circ\text{C}$ $T_j = 100^\circ\text{C}$		1.1	4	V V
t_s	Storage Time	$I_C = 2.5A \quad V_{CC} = 50V$		0.8		μs
t_f	Fall Time	$V_{BB} = -5V \quad R_{BB} = 2.4\Omega$		0.05		μs
t_c	Cross Over Time	$V_{clamp} = 400V \quad I_{B1} = 0.25A$ $L = 1mH$		0.08		μs
t_s	Storage Time	$I_C = 2.5A \quad V_{CC} = 50V$			1.8	μs
t_f	Fall Time	$V_{BB} = -5V \quad R_{BB} = 2.4\Omega$			0.1	μs
t_c	Cross Over Time	$V_{clamp} = 400V \quad I_{B1} = 0.25A$ $L = 1mH \quad T_j = 100^\circ\text{C}$			0.18	μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_C = 2.5A \quad V_{CC} = 50V$ $V_{BB} = -5V \quad R_{BB} = 2.4\Omega$ $V_{clamp} = 400V \quad I_{B1} = 0.25A$ $L = 1mH \quad T_j = 125^\circ\text{C}$	500			V
t_s	Storage Time	$I_C = 2.5A \quad V_{CC} = 50V$		1.5		μs
t_f	Fall Time	$V_{BB} = 0 \quad R_{BB} = 0.6\Omega$		0.04		μs
t_c	Cross Over Time	$V_{clamp} = 400V \quad I_{B1} = 0.25A$ $L = 1mH$		0.07		μs

ELECTRICAL CHARACTERISTICS (continued)

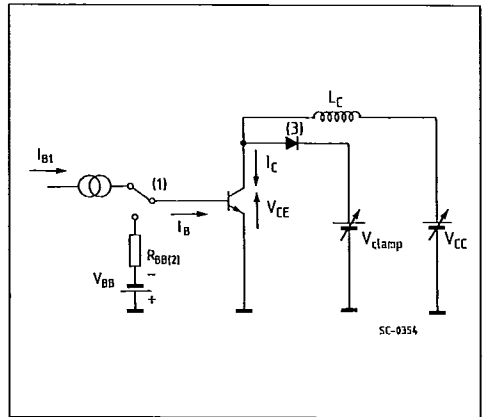
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
t_s t_f t_c	Storage Time Fall Time Cross Over Time	$I_C = 2.5A$ $V_{BB} = 0$ $V_{clamp} = 400V$ $L = 1mH$	$V_{CC} = 50V$ $R_{BB} = 0.6\Omega$ $I_{B1} = 0.25A$ $T_j = 100^\circ C$			3 0.15 0.25	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_C = 2.5A$ $V_{BB} = 0$ $V_{clamp} = 400V$ $L = 1mH$	$V_{CC} = 50V$ $R_{BB} = 0.6\Omega$ $I_{B1} = 0.25A$ $T_j = 125^\circ C$	500			V
t_s t_f t_c	Storage Time Fall Time Cross Over Time	$I_C = 5A$ $V_{BB} = -5V$ $V_{clamp} = 400V$ $L = 0.5mH$	$V_{CC} = 50V$ $R_{BB} = 2.4\Omega$ $I_{B1} = 1A$		1.9 0.06 0.12		μs μs μs
t_s t_f t_c	Storage Time Fall Time Cross Over Time	$I_C = 5A$ $V_{BB} = -5V$ $V_{clamp} = 400V$ $L = 0.5mH$	$V_{CC} = 50V$ $R_{BB} = 2.4\Omega$ $I_{B1} = 1A$ $T_j = 100^\circ C$			3.2 0.12 0.3	μs μs μs
V_{CEW}	Maximum Collector Emitter Voltage without Snubber	$I_{C\text{Woff}} = 7.5A$ $V_{BB} = -5V$ $L = 0.33mH$ $T_j = 125^\circ C$	$I_{B1} = 1.5A$ $V_{CC} = 50V$ $R_{BB} = 2.4\Omega$	400			V

Turn-on Switching Test Circuit.



- (1) Fast electronic switch
- (2) Non-inductive Resistor

Turn-off Switching Test Circuit.



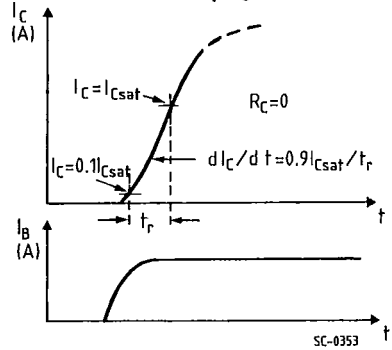
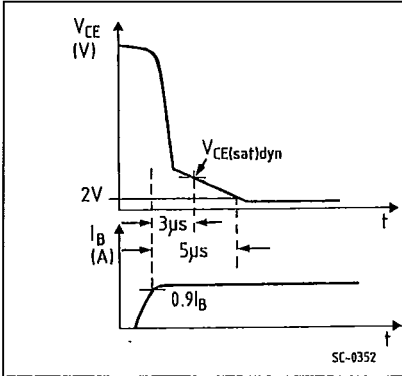
- (1) Fast electronic switch
- (2) Non-inductive Resistor
- (3) Fast recovery rectifier

SGS-THOMSON

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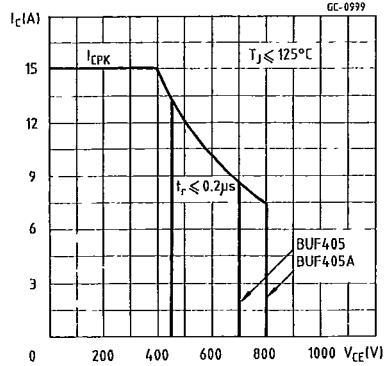
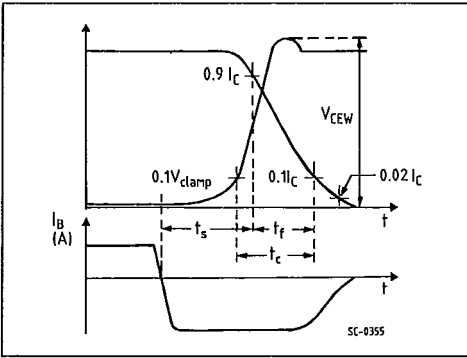
Turn-on Switching Test Waveforms.

T-33-13



Turn-off Switching Waveforms (inductive load).

Forward Biased Safe Operating Areas.



Reverse Biased Safe Operating Areas.

